Appeal of provisions for Demand Responsive Controls
in the
2024 draft International Energy Conservation Code
Commercial and Residential

Building Owners and Managers Association International
and the
National Multifamily Housing Council

December 2023
Specific description of the issue being appealed:
The 2024 International Energy Conservation Code – Residential (IECC-R) mandates the provision of demand responsive (DR) controls for certain service water heating equipment and the International Energy Conservation Code – Commercial (IECC-C) mandates the provision of DR controls for equipment for HVAC space conditioning, service water heating, and lighting, regardless of whether these controls can even function as intended. These requirements violate the core intent of the IECC to provide “minimum efficiency requirements for buildings that result in the maximum level of energy efficiency that is safe, technologically feasible, and life cycle cost effective, considering economic feasibility, including potential costs and savings for consumers and building owners, and return on investment.”

Further, to the extent that the IECC knowingly requires controls equipment that cannot be used to provide the desired controls, the scope of the IECC is violated. The scope of the ICC is applicable to the design and construction of buildings. Per the definition of “building,” in Section C202, mechanical and electrical equipment within the scope of the IECC must support the building. Such controls equipment that cannot be used for the intended control does not support the building and therefore is out-of-scope of the IECC.

Statement describing precisely why the issue is being appealed:
The DOE Energy Information Administration tracks utilities that provide demand response (DR) programs. Data from 2022 indicates that of 336 electric utilities, 100 did not have any residential customers enrolled in a DR program, and 131 have no commercial customers enrolled, indicating no such program exists.

Re-stated, nearly one-third of electric utilities evidently do not offer DR programs. In these jurisdictions a requirement for DR controls for HVAC, lighting, or service water heating equipment is a requirement for a building owner to provide and install devices and equipment which cannot function as intended. According to PNNL, for residential buildings, “… the incremental cost of upgrading from a standard programmable thermostat to a smart thermostat with DR controls is anywhere between $100 and $200.” In a 200-unit apartment or condominium building, where no DR program exists, $20,000 to $40,000 would be wasted on DR HVAC controls required by the 2024 IECC.

For DR lighting controls, homewyse estimates a cost range of $6,927 to $8,396. For DR controls for water heating PNNL says, the most straightforward way to implement the CTA-2045 communication for DR control is to switch to an HPWH (Heat Pump Water Heater) with an incremental cost of $975. PNNL advocates HPWHs in part because, “Electric resistance water heaters supplied with CTA-2045 communication have been manufactured but are not widely available.”

Aside from the question of whether a requirement for specific water heater controls creates a Federal preemption violation, adding nearly $1,000 of cost for water heater DR controls, and $7,000+ for lighting DR controls, to a dwelling unit where no utility DR program exists clearly violates the intent of the IECC to provide “minimum efficiency requirements for buildings.”

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1 https://www.eia.gov/electricity/data/eia861/ (Site has a year 2022 zip folder download with an included Demand Response spreadsheet)
3 https://www.homewyse.com/services/cost_to_design_and_install_lighting_control_system.html
4 PNNL. See footnote 2, page 6.
Similarly, a further intent of the IECC (both residential and commercial) is to provide requirements “that result in the maximum level of energy efficiency that is safe, technologically feasible, and life cycle cost effective, considering economic feasibility, including potential costs and savings for consumers and building owners, and return on investment.” Equipment that cannot be used as intended does not support the building, provides no return on investment, and therefore cannot be life cycle cost effective. Requiring such equipment violates the scope and intent of the IECC.

Most egregiously, there is also no need for the IECC to require DR controls in jurisdictions where DR programs do exist because the electric utilities (EUs) serving those jurisdictions, (more than 66 percent of the EUs), typically use incentives to pay building owners to install and use DR controls. The EUs compensate building owners for the installation and use of DR controls because it benefits the EUs’ businesses. DR controls are primarily intended to manage electric grid operations; they directly benefit EU operators, allowing them to manage demand, pricing, and costs.

Note that where DR programs are offered by the local EU, customers only join on a voluntary basis. For the remaining owners in that EU’s service area - those that do not want to participate in a DR program - a code mandate to have DR controls provides no benefit and is an unnecessary cost.

Importantly, where a DR program exists and a customer later decides to participate in the program, it is a simple matter to change a thermostat and, when replacing a water heater in the future, to opt for a DR capable unit. In this way owners are responsible for the decisions regarding the “economic feasibility, including potential costs and savings” of their equipment choices rather than having an IECC consensus committee at arm’s length from the circumstance make that decision.

A general purpose of the ICC is the “the lessening of burdens of government through the development, maintenance and publication of model statutes and standards for the use by federal, state and local governments in connection with the administration of building laws and regulations.” Federal, state, and local government burdens are not lessened by using the IECC to end-run local fiscal policy and regulation of EUs.

In keeping with the ICC’s bylaws, no part of the intent of the IECC says it is to be used to serve as a policy to transfer assets from owners to electric providers and this appeal should be sustained.

Incorporation of requirements in the IECC that violate the scope and intent of the IECC represent a material and significant irregularity of process.

Detailed description of how the issue being appealed will adversely affect the appellant:

The National Multifamily Housing Council (NMHC) provides a voice for America’s apartment industry. Our membership is engaged in all aspects of the apartment industry, including ownership, development, management, and finance. NMHC represents the principal officers of the apartment industry’s largest and most prominent firms.

The Building Owners and Managers Association (BOMA) International is the leading trade association for commercial real estate professionals for more than 100 years. It represents the owners, managers, service

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providers and other property professionals of all commercial building types, including office, industrial, medical, corporate, and mixed-use. BOMA International is the voice of commercial building owners and operators.

According to recent research commissioned by NMHC, the U.S. needs to build 4.3 million new apartment homes by 2035 to meet the demand for rental housing.6 This includes an existing shortage of 600,000 apartments stemming from underbuilding due in large part to the 2008 financial crisis. Further, underproduction of housing has translated to higher housing costs – resulting in a consequential loss of affordable housing units (those with rents less than $1,000 per month), with a decline of 4.7 million affordable apartments from 2015-2020.

In fact, the total share of cost-burdened apartment households (those paying more than 30% of their income on housing) has increased steadily over several decades and reached 57.6% in 2021.7 During this same period, the total share of severely cost-burdened apartment households (those paying more than half their income on housing) increased from 20.9 to 31.0%.8

Further, the Biden Administration has recognized this immense need to bolster the nation’s housing production and outlined a strategy to improve housing supply conditions through the Housing Supply Action Plan. The plan underscores that this national supply shortfall “burdens family budgets, drives up inflation, limits economic growth, maintains residential segregation, and exacerbates climate change.”9 And that “[r]ising housing costs have burdened families of all incomes, with a particular impact on low- and moderate-income families, and people and communities of color.”10

It is becoming increasingly difficult to build housing that is affordable to a wide range of income levels. Ongoing materials and equipment shortages and strained supply chain conditions pressures housing development and results in costs and delays that impact overall affordability and availability. In addition, ill-timed, unnecessary, or unduly burdensome laws, policies, and regulations – such as requirements to provide DR controls where no DR program exists - prevent us from delivering the housing our country so desperately needs. Elevated regulatory costs, particularly, create a barrier to affordable housing supply. Recent research published by NMHC and the National Association of Home Builders found that regulation imposed by all levels of government accounts for 40.6 percent of multifamily development costs.11

Following extreme, pandemic-fueled volatility in product costs, supply chain stability, and staffing constraints, the apartment construction and renovation pipeline has seen some moderation yet continues to face difficult conditions. Construction delays are prevalent – with 88 percent of respondents reporting delays in NMHC’s September 2023 Quarterly Survey of Apartment Construction and Development Activity. Further, 48 percent of respondents reported experiencing repricing increases in projects over the last three months. Respondents experiencing delayed starts cited a range of causes including lack of construction financing and project infeasibility, while the availability of necessary products and materials,

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8 Id.
9 “President Biden Announces New Actions to Ease the Burden of Housing Costs.” (May 16, 2022) [https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/16/president-biden-announces-new-actions-to-ease-the-burden-of-housing-costs/](https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/16/president-biden-announces-new-actions-to-ease-the-burden-of-housing-costs/)
10 Id.
or lack thereof, saw the largest increase in responses, with 30 percent of respondents citing materials sourcing and delivery challenges as a contributing factor to delayed starts (up from 10 percent in the previous quarter).

Apartment builders and developers also continue to be impacted by escalations in materials costs. The prices of a myriad of essential building products and equipment continue to rise, with respondents reporting a 7% average increase in residential appliance costs over a three-month period. A sizeable portion of respondents further reported relying on alternative brands or suppliers to mitigate price increases and supply shortages for appliances (58%).

Adding DR equipment and devices mandated by the IECC to already constrained supply chains fundamentally reduces the ability of NMHC members to meet the nation’s housing needs and BOMA International members to meet the changing, post-pandemic needs of commercial building inventories.

**Statement indicating the requested remedial action:**
NMHC and BOMA International request that all provisions mandating DR controls be deleted from the IECC for failure to comply with the respective scopes and intents of the IECC-R and IECC-C. Those requirements are in the following sections:

- IECC-R Section R403.5.5 Demand responsive water heating
- IECC-C Sections C403.4.6 Demand responsive controls, C404.10 Demand responsive water heating, and C405.2.8 Demand responsive lighting controls

NMHC and BOMA International are not requesting that owner selectable DR requirements in IECC-R Section R408 or IECC-C Section C406 be deleted. These are optional requirements and provide an incentive for owners to join a DR program where such program exists.

NMHC and BOMA International are also not opposed to “*optional supplemental requirements*” for DR controls being placed in adoptable appendices as permitted by the respective intents of the IECC-R and IECC-C. Presumably local governments will only adopt such an appendix where the local EU offers a DR program and required controls can work as intended.

Alternatively, if DR requirements are found by the appeals board to comply with the respective intents of the IECC-R and IECC-C to potentially “include nonmandatory appendices incorporating additional energy efficiency and greenhouse gas reduction resources developed by the Code Council and others,” NMHC and BOMA International request that all provisions currently mandating provision of DR controls be placed in nonmandatory language appendices of the applicable codes. In accordance with the direction provided by ICC’s February 15, 2022 memorandum, nonmandatory appendices are informational and not adoptable, meaning such appendices are drafted in nonmandatory language.

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The names and mailing addresses of individuals and organizations that may have an interest in or be affected by the matter being appealed:

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Demand Response in Residential Energy Code

Technical Brief

September 2021

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Technical Brief

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Prepared for
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Preamble

The U.S. Department of Energy (DOE) and Pacific Northwest National Laboratory (PNNL) are developing a series of technical briefs supporting national, state, and local initiatives to update and advance building energy codes. These technical briefs represent specific technologies, measures, or practices that can be incorporated as module-based “plug-ins” via the national model energy codes, such as the International Energy Conservation Code (IECC) or ASHRAE Standard 90.1, or can be adopted directly by state and local governments pursuing advanced energy savings and greenhouse gas emissions reductions. The collection of briefs is part of a larger effort to provide technical assistance supporting states and local governments and to help them realize their policy goals.

This technical brief provides requirements for demand-responsive thermostats and water heaters that could be incorporated into model residential energy codes. It provides background on the benefits of these devices, impacts on the cost of construction, and model code language that can be plugged into the IECC or adapted into other energy codes.

Additional assistance may be available from DOE and PNNL to support states and local governments who are interested in adding demand response and other “stretch” provisions to their building codes. Assistance includes technical guidance, customized analysis of expected impacts (e.g., based on state-specific building stock, climate considerations, or utility prices), and further tailored code language to overlay state building codes or other standards. DOE provides this assistance in response to the Energy Conservation and Production Act, which directs the Secretary of Energy to provide technical assistance “to support implementation of state residential and commercial building energy efficiency codes” (42 USC 6833). PNNL supports this mission by evaluating concepts for future code updates, conducting technical reviews and analysis of potential code changes, and assisting states and local jurisdictions who strive to adopt, comply with, and enforce energy codes. This helps assure successful implementation of building energy codes, as well as a range of advanced technologies and construction practices, and encourages building standards that are proven to be practical, affordable, and efficient.

DOE Building Energy Codes Program

DOE supports the advancement of building energy codes. Modern building codes and standards offer cost-effective solutions, contributing to lower utility bills for homes and businesses and helping mitigate the impacts of climate change. Learn more at energycodes.gov.
Executive Summary

As buildings account for over 70% of U.S. electricity use, effectively managing their loads can greatly facilitate the transition towards a clean, reliable grid. Grid-interactive efficient buildings (GEBs) combine efficiency and demand flexibility with smart technologies and communication to provide occupant comfort and productivity while serving the grid as a distributed energy resource (DER). In turn, GEBs can play a key role in ensuring access to an affordable, reliable, sustainable and modern U.S. electric power system. Their national adoption could provide $100-200 billion in U.S. electric power system cost savings over the next two decades. The associated reduction in CO₂ emissions is estimated at 6% per year by 2030.¹

Building codes represent standard design practice in the construction industry and continually evolve to include advanced technologies and innovative practices. Historically, national model energy codes establish minimum efficiency requirements for new construction.² Expanding codes to support GEB capabilities is a pivotal step towards realizing demand flexibility in support of a clean grid by addressing capabilities to improve interoperability between smart building systems, the grid, and renewable energy resources. Realizing GEBs requires buildings with automated demand response (DR) capabilities that enable standardized control, subject to explicit consumer consent, of energy smart appliances on an electricity network. This is achieved through communication between appliances and a controlling entity that is in communication with the consumer participants.

Energy codes can support DR communication standardization and advance the deployment of flexible load technologies such as smart home energy management systems, energy storage, behind-the-meter generation, and electric vehicles (EVs). Incorporating automated DR capabilities in energy codes provides many benefits to consumers and society. Specifically, it matches intermittent renewable energy sources to building electric loads, decreases peak load on the electric grid, allows buildings to respond to utility price signals, supports electrical network reliability and market growth of products and processes aligned with clean economic growth.

The incorporation of DR into the model residential energy codes was considered for the 2021 International Energy Conservation Code (IECC) code development cycle. The approved DR measures were later removed in response to appeals.³ This technical brief updates the proposed DR components such that they can be considered by states and local governments for direct incorporation into their codes, as well as for future IECC energy code development. The proposal refinements are intended to support consistency in approach and provide a degree of certainty for building owners, designers, contractors, manufacturers, and building and fire safety professionals. The scope of this technical brief includes two strategies for DR in

² While advanced codes can be considered model codes, in this document, the term “model energy code” refers to the current published version of the International Energy Conservation Code-Residential and ASHRAE Standard 90.1, as those documents are referenced by the Energy Conservation and Production Act, as modified by the Energy Policy Act of 1992, as the minimum requirements for states adopting energy codes. https://www.govinfo.gov/content/pkg/USCODE-2011-title42/pdf/USCODE-2011-title42-chap81-subchapI.pdf
residential buildings: 1) smart thermostats with demand-responsive control and 2) electric water heating incorporating demand-responsive controls and communication.
Contents

Preamble....................................................................................................................................... ii
Executive Summary ...................................................................................................................... iii
1.0 Demand Response in Residential Energy Codes ................................................................... 1
   1.1 Smart Thermostats with DR Control ........................................................................... 2
   1.2 Water Heating with DR Control .............................................................................. 3
   1.3 Benefits of Demand Response .............................................................................. 4
2.0 Economic Analysis .............................................................................................................. 6
3.0 Sample Code Language ....................................................................................................... 7
   3.1 Definitions .............................................................................................................. 7
   3.2 Demand-Responsive Thermostats ........................................................................... 7
   3.3 Demand-Responsive Water Heating ....................................................................... 8
4.0 References ........................................................................................................................ 9
1.0 Demand Response in Residential Energy Codes

A rapid transition of the U.S. power system is underway that is reshaping the operation and performance of the electric grid. Persistent growth in renewable energy resources—driven by declining costs, improved performance, and decarbonization policies—is starting to noticeably impact the electricity system. As buildings account for over 70% of U.S. electricity use, effectively managing their loads can greatly facilitate this transition towards a clean, reliable grid. Grid-interactive efficient buildings (GEBs) combine efficiency and demand flexibility with smart technologies and communication to provide occupant comfort and productivity while serving the grid as a distributed energy resource (DER). In turn, GEBs can play a key role in ensuring access to an affordable, reliable, sustainable and modern U.S. electric power system. Their national adoption could provide $100-200 billion in U.S. electric power system cost savings over the next two decades. The associated reduction in CO2 emissions is estimated at 6% per year by 2030. DOE’s national GEB vision is to triple energy efficiency (EE) and demand flexibility (DF) of the buildings sector by 2030 relative to 2020 levels.

Building codes represent standard design practice in the construction industry and continually evolve to include advanced technologies and innovative practices. Historically, national model energy codes establish minimum efficiency requirements for new construction. Expanding codes to support GEB capabilities is a pivotal step towards realizing DF in support of a clean grid by addressing capabilities to improve interoperability between smart building systems, the grid, and renewable energy resources. Realizing GEBs requires buildings with automated demand response (DR) capabilities that enable standardized control, subject to explicit consumer consent, of energy smart appliances on an electricity network. This is achieved through communication between appliances and a controlling entity that is in communication with the consumer participants. Energy codes can support DR communication standardization and advance the deployment of flexible load technologies such as smart home energy management systems, energy storage, behind-the-meter generation, and electric vehicles (EVs).

Incorporating GEB considerations in energy codes can benefit all consumers by providing the following impacts:

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1 Thirty-seven states representing 80% of the U.S. population have enacted renewable portfolio standards or goals.
3 Capability provided by DERs to reduce, shed, shift, modulate or generate electricity; energy flexibility and load flexibility are often used interchangeably with demand flexibility.
5 While advanced codes can be considered model codes, in this document, the term “model energy code” refers to the current published version of the International Energy Conservation Code-Residential and ASHRAE Standard 90.1, as those documents are referenced by the Energy Conservation and Production Act, as modified by the Energy Policy Act of 1992, as the minimum requirements for states adopting energy codes. https://www.govinfo.gov/content/pkg/USCODE-2011-title42/pdf/USCODE-2011-title42-chap81-subchapII.pdf.
• Match the short-term availability of intermittent renewable energy sources, such as wind and solar, with building electric loads
• Decrease the peak load on the electrical transmission and distribution networks to alleviate the need for network upgrades to handle new electric loads
• Allow buildings to respond to utility price signals and provide grid services that control network characteristics, such as line frequency, system inertia and network voltage, and help prevent network and generation outages
• Allow electricity suppliers to offset their short-term market imbalance by controlling flexible load on the network
• Provide a market signal to companies and investors to develop products and processes that align buildings with the transition towards clean economic growth.

The incorporation of DR into the model residential energy codes was considered for the 2021 International Energy Conservation Code (IECC) code development cycle. The approved DR measures were later removed in response to appeals.\(^1\) DOE developed this technical brief to update the DR concept such that it can be considered by states and local governments for direct incorporation into their codes, as well as for future IECC energy code development. The DR requirements specified in this technical brief build upon the language considered for the 2021 IECC, as well as that contained in the New Buildings Institute’s Building Decarbonization Code (NBI 2021). In addition to sample code language, this technical brief adds further information and analysis developed by Pacific Northwest National Laboratory (PNNL). These requirement refinements are intended to support consistency in approach and provide a degree of certainty for building owners, designers, contractors, manufacturers, and building and fire safety professionals.

The scope of this technical brief includes two strategies for DR in residential buildings:

• Smart thermostats with demand-responsive control
• Electric water heating incorporating demand-responsive controls and communication.

### 1.1 Smart Thermostats with DR Control

Thermostats have evolved over the many years since their first introduction for scheduling and control of heating, ventilation, and air conditioning (HVAC) equipment. The first programmable thermostat was released to the market in 1906 with additional features and functionality added over the ensuing decades (DOE 2016). The first digital programmable thermostats were introduced in the mid-1980s. In the 1990s and into the 2000s, thermostats continued to evolve with additional sophistication such as individual day scheduling, equipment control choices, and ancillary services such as humidification, dehumidification, and ventilation. Programmable thermostats were projected to reduce HVAC energy use by 30% (Pang et al. 2020). However, expected levels of energy savings from programmable thermostats were not achieved because of consumer frustration or apathy on the intricacies of programming the thermostat (DOE 2016). Savings projections were based on correct and optimal use of programming functionality.

In response to the usability issues of programmable thermostats, connected (smart) thermostats with improved interfaces and learning algorithms were brought into the market. Smart thermostats capitalized on advancement of data and communication technologies as well as

simplifying the scheduling process (DOE 2016). Today’s smart thermostat market is under 15 years old and has evolved quickly through rapid growth and innovation. The interaction of smart thermostats with a smart home can enhance security, comfort, and convenience. The next generation of smart thermostats will communicate with the grid for demand-responsive control.

Smart thermostats with DR control for heating and cooling systems are designed to communicate with the utility grid and adjust heating and cooling setpoints to preprogramed levels during times of high demand or high energy prices. Thermostats with DR control allow grid operators to reduce residential heating and cooling demand on the grid and keep expensive and high-pollution-generating systems offline.

California’s Title 24 Residential Code stipulates that heating, cooling, and ventilation systems have thermostatic control with the ability to:

1. Automatically adjust temperature setpoints by +/- 4° Fahrenheit from a central point
2. Return the system to its original setpoint after the event
3. Provide an adjustable rate of change

Residential smart thermostat requirements described in the sample code language do not include all the controls of a Title 24 compliant thermostat, but a Title 24 compliant thermostat meets the residential DR control requirements prescribed in this technical brief.

### 1.2 Water Heating with DR Control

Water heating accounts for 19% of the annual energy consumption in the U.S. residential building stock. Electric storage water heaters provide an excellent opportunity for load shedding/shifting due to the energy storage capacity of the hot water. Heat pump water heaters (HPWHs) have the potential to reduce the annual energy consumption of residential water heating by 60% when compared to electric resistance water heating (Mayhorn et al. 2015). HPWHs can be loaded (increase in water temperature) or turned down or off to take advantage of lower utility pricing and lower hourly carbon emission rates during periods of low demand. A study conducted by PNNL developed typical load shapes of HPWHs in the Pacific Northwest (Hunt et al. 2021). The HPWH load shapes can help utilities and DR aggregators establish baseline behavior and improve load forecasting algorithms.

Water heaters require a minimum storage capacity of 20 gallons to provide sufficient energy storage for adequate load flexibility. Four potential strategies for water heating demand-responsive control with various levels of sophistication and regulation are described below. The grid-connected strategy allows full DF in response to a real-time price signal or demand on the grid.

- **Manual Control** – manual adjustment of appliance loads
- **On/Off Control** – controlled on a fixed price time-of-use schedule
- **Load Up/Shed** – load up water heater over setpoint temperature during demand trough and shed on peak demand

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• Grid Connected – water heater control based on future forecasting of demand from utility.

Water heaters with demand-responsive control must be supplied with a communication link that meets the Consumer Technology Association Standard 2045 (CTA-2045) for communication with the electric grid or DR signal providers. The CTA-2045 communication protocol stipulates controls to allow an HPWH to overload the tank temperature and increase storage capacity. The communication interface is analogous in concept to a USB socket on computers and other electronic equipment, but this socket is specifically designed for appliances. CTA-2045 is the industry standard for demand-responsive control in water heaters but allows other communication protocols approved by a building official or other authority having jurisdiction.

1.3 Benefits of Demand Response

DR provides substantial benefits to the consumer, utilities, and society (Xing et al. 2018). Consumers can reduce energy consumption during peak demand, take advantage of time-of-use or real-time pricing, and lower electric utility bills. Utilities can reduce capital costs, reduce fuel consumption and operating costs, and increase productivity and profit margins while operating power plants at optimized speeds. Societal benefits include enhanced grid resilience and stability, lower carbon emissions, and higher penetration of renewable energy resources. It is difficult to place a value on the utility and consumer benefits of DR, but it appears to be a win-win situation for all. A more complete list of benefits is shown below.

Consumer Benefits
• Take advantage of time-of-use or real-time pricing
• Less rolling blackouts
• Reduced energy consumption during peak demand
• Reduced wholesale energy prices and prices paid by consumers
• Lower utility bills

Utility Benefits
• Reduced capital cost
• Reduced carbon emissions
• Reduced fuel consumption and operating costs
• Increased productivity and profit margins
• Operate power plants at optimized speeds
• Grid resilience and stability
• Enhanced voltage stability
• Balanced fluctuations in renewable energy generation

2 https://www.bpa.gov/EE/Technology/demand-response/Pages/CTA2045-DataShare.aspx
Societal Benefits

- Enhanced grid resilience and stability
- Reduced carbon emissions
- Higher penetrations of renewable energy resources
2.0 Economic Analysis

The costs associated with installing residential DR control strategies highlighted in this technical brief are discussed below. The installed costs for smart thermostats and electric water heaters with DR control are modest and depend on the design of the home.

The cost of a standard programmable thermostat required in the 2021 IECC ranges from $20 to $100 based on costs at local home improvement stores. A smart thermostat can range from $120 to $400 based on brand, model, and level of sophistication. The cost to install a programmable or smart thermostat ranges from $112 to $255, with the national average cost of $175.1 Thus, the incremental cost of upgrading from a standard programmable thermostat to a smart thermostat with DR controls is anywhere between $100 and $200.

Electric resistance water heaters supplied with CTA-2045 communication have been manufactured but are not widely available. HPWHs have taken over the energy efficiency segment of the water heater market, and brands at local home improvement stores include the CTA-2045 communication ports. The average cost for a 50-gallon electric resistance heater is $400, while the average cost for a 50-gallon HPWH is $1,300 at local home improvement stores (Salcido et al. 2021). The incremental cost of $900 plus additional condensate removal equipment of $75 results in a total cost differential of $975. Therefore, for buildings already including HPWHs in the original design, the incremental increase in cost is $0. If the building specified an electric resistance water heater, the most straightforward way to implement the CTA-2045 communication for DR control is to switch to an HPWH with an incremental cost of $975.

While DR control functionality will reduce costs to utilities as well as electric costs to consumers, it is difficult to estimate or calculate the actual cost savings. DR will present cost-saving opportunities for buildings as more homeowners take advantage of time-of-use or real-time pricing controls as they become more widely available. Adding DR controls in model energy codes can help homeowners have the capability of participating in DR programs with alternative utility pricing structures whether they exist now or in the future. When DR requirements are part of the model energy code, it will not require homeowners or buildings to participate in any DR programs but will guarantee that residential buildings are capable of participating in DR programs.

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1 https://www.homeadvisor.com/cost/heating-and-cooling/install-a-thermostat/
3.0 Sample Code Language

This section contains model code language for any state or local government to overlay the 2021 IECC or that can be adapted to other existing residential energy codes.

3.1 Definitions

The following definition shall be added to Section R202 of the 2021 IECC residential energy code.

DEMAND-RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to DR requests from a utility, electrical system operator, or third-party DR program provider.

3.2 Demand-Responsive Thermostats

The following DR requirements shall be placed in Section R403.1.1 of the 2021 IECC residential energy code or analogous location of other existing code.

R403.1.1 Programable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature setpoints at different times of the day and different days of the week. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures of not less than 55 °F (13 °C) to not greater than 85 °F (29 °C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70 °F (21 °C) and a cooling temperature setpoint of not less than 78 °F (26 °C). The thermostat shall be provided with Demand-Responsive Control capable of increasing the cooling setpoint by no less than 4 °F (2.2 °C) and decreasing the heating setpoint by no less than 4 °F (2.2 °C) in response to a DR request.

1. All demand-responsive controls shall be either:
   
   a. A certified OpenADR 2.0a or OpenADR 2.0b Virtual End Node (VEN), as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification1, or
   
   b. Certified by the manufacturer as being capable of responding to a DR signal from a certified OpenADR 2.0b Virtual End Node by automatically implementing the control functions requested by the Virtual End Node for the equipment it controls, or

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c. **Comply with IEC 62746-10-1**, an international standard for the open automated DR system interface between the smart appliance, system, or energy management system and the controlling entity, such as a utility or service provider\(^1\), or
d. **Comply with the communication protocol required by a controlling entity, such as a utility or service provider, to participate in an automated DR program.**

2. All demand-responsive controls shall be capable of communicating to the VEN using one or more of the following: Wi-Fi, ZigBee, BACnet, Ethernet, or hard-wiring any other bi-directional communication pathway.

3. When communications are disabled or unavailable, all demand-responsive controls shall continue to perform all other control functions provided by the control.

### 3.3 Demand-Responsive Water Heating

*The following DR requirements shall be placed in Section R403.5.4 of the 2021 IECC residential energy code or analogous location of other existing code.*

#### R403.5.4 Demand-responsive water heating

All electric storage water heaters with a storage tank capacity greater than 20 gallons (76 L) shall be provided with demand-responsive controls that comply with CTA-2045 or another demand-responsive control approved by the Authority Having Jurisdiction.

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\(^1\) IEC 62746-10-1(E) specifies a minimal data model and services for demand response (DR), pricing, and distributed energy resource (DER) communications. It specifies how to implement a two-way signaling system to facilitate information exchange between electricity service providers, aggregators, and end users. The DR signaling system is described in terms of servers (virtual top nodes or VTNs), which publish information to automated clients (virtual end nodes, or VENs), which in turn subscribe to the information. Note the OpenADR 2.0b Profile Specification is known as IEC 62746-10-1 ED1.
4.0 References


## Cost to Design and Install Lighting Control System

In June 2023 the cost to Design and Install Lighting Control System starts at $6,927 – $8,396 per system. For accurate estimating, use our Cost Calculator for estimates customized to the location, size and options of your project.

To estimate costs for your project:
1. Set Project Zip Code
2. Specify Project Size and Options
3. Review calculations

### Unit Costs: How Pros Price

Unlike other websites that publish pricing from unrelated jobs in the past, Homewyse creates up-to-date estimates from current Unit Costs. The Unit Cost method delivers high accuracy by using location, details and options for the unique requirements of each job. Contracting, trade design and maintenance businesses rely on the Unit Cost method for transparency, accuracy and fair profits.

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**Cost to Design and Install Lighting Control System - Notes and General Information**

These are for BASIC work performed in serviceable conditions by qualified trade professionals using MID GRADE materials. Work not mentioned on this page and work using master craftsmen, premium materials and project supervision will result in HIGHER COSTS.

These estimates are NOT substitutes for written quotes from trade professionals. Homewyse strongly recommends that you contact reputable professionals for accurate assessments of work required and costs for your project - before making any decisions or commitments.

The cost estimate includes:
- Costs for local material/equipment delivery to and service provider transportation to and from the job site.
- Costs to prepare the workspace for Lighting Control System Design and Installation, including costs to protect existing structures, finishes, materials, and components.
- Labor setup time, mobilization time and minimum hourly charges that are commonly included for small Lighting Control System Design and Installation jobs.
- Costs for testing and remediation of hazardous materials (asbestos, lead, etc.).
- General contractor overhead and markup for organizing and supervising the Lighting Control System Design and Installation. Add 13% to 22% to the total cost above if a general contractor will supervise this project.
- Sales tax on materials and supplies.
- Permit inspections (if required) for your jurisdiction.

The cost estimate does NOT include:
- Costs for removing, relocating, repairing or modifying existing framing, surface, HVAC, electrical, and plumbing systems - or bringing those systems into compliance with current building codes.
- Costs for testing and remediation of hazardous materials (asbestos, lead, etc.).
- Labor/setup costs (if required) for your jurisdiction.

### References - Lighting Control System Design and Installation

- Project Costing Data: Harvard University/CHEMS Environmental Health Services Harvard University, June 2023, Website
ARTICLE I — NAME AND OBJECTIVES

1.1 Name - This organization shall be known as the International Code Council, Inc., hereinafter in these Bylaws referred to as the "Council" or the "Corporation".

1.2 General Purposes - The Council is a nonprofit nonstock corporation and is not organized for the private gain of any person. The Corporation is organized exclusively as an organization described in Section 501(c)(6) of the Internal Revenue Code of 1986, as amended, or the corresponding provision in any future United States internal revenue law (the "Code"). Notwithstanding any other provision herein, the Corporation shall not engage in a regular business activity of a kind ordinarily carried on for profit and shall not carry on any other activity not permitted to be carried on by a corporation exempt from federal income tax under Section 501(c)(6) of the Code. It is organized under the Delaware General Corporation Law for public and charitable purposes. Such purposes specifically include:

With respect to buildings and structures: (a) the lessening of burdens of government through the development, maintenance and publication of model statutes and standards for the use by federal, state and local governments in connection with the administration of building laws and regulations, and (b) the lessening of the burdens of government through the performance of certain services for the benefit of federal, state and local governments in connection with the administration of building law and regulation.

1.3 Principal Office - The Corporation shall have and continuously maintain a registered office in the State of Delaware and a registered agent whose principal business office is identical with such registered office.

ARTICLE II — MEMBERSHIP

2.1 Categories of Membership - The Council shall have the following categories of voting membership:

2.1.1 Governmental Member - A Governmental Member shall be a governmental unit, department or agency engaged in the administration, formulation, implementation or enforcement of laws, ordinances, rules or regulations relating to the public health, safety and welfare. Each Governmental Member shall designate its Primary Representative who will receive benefits of membership in the Council on behalf of the Governmental Member as determined by the Board of Directors from time to time.

2.1.1.1 Governmental Member Voting Representatives - Each Governmental Member shall exercise its right to vote through its designated Governmental Member Voting Representatives, and shall be entitled to the number of Governmental Member Voting Representatives as specified in Table 2.1.1.1. Governmental Member Voting Representatives shall be designated in writing, by the Governmental Member, and shall be employees or officials of the Governmental Member or departments of the Governmental Member, provided that each of the designated voting representatives shall be an employee or a public official actively engaged either full or part time, in the administration, formulation, implementation or enforcement of laws, ordinances, rules or regulations relating to the public health, safety and welfare. The designation of a Governmental Member Voting Representative may be changed by the Governmental Member, in writing, from time to time.
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<thead>
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<th>Voting Representatives</th>
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<tr>
<td>50,001 to 150,000</td>
<td>8</td>
</tr>
<tr>
<td>Over 150,000</td>
<td>12</td>
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### 2.1.2 Honorary Member
- An individual who has rendered outstanding service to the Council, and whose name shall be proposed by the Board of Directors and confirmed by a majority vote of the Voting Members, as defined in Article III of these Bylaws, at an Annual Business Meeting.

### 2.1.3 Non-voting categories:
- The Board of Directors shall establish the non-voting categories of membership as may be necessary for the adequate representation of all parties interested in association with the International Code Council. Non-voting categories shall provide for membership of individuals and corporate entities and shall include, but not necessarily be limited to, employees of governmental units, design professionals, corporations, educational institutions, not-for-profit associations, and other individuals interested in the purposes and objectives of the Council.

### 2.2 Classification by the Board of Directors
- All applications for membership shall be subject to classification by and approval of the Board of Directors. Applicants shall be eligible for membership on approval of the membership application by the Board and on timely payment of such dues and fees as the Board may fix from time to time. This authority may be delegated by the Board of Directors to the Chief Executive Officer.

### 2.3 Dues
- The annual dues for each membership category shall be established by the Board of Directors. In no case shall a person be considered in good standing, or be qualified to exercise membership participation or entitled to receive any privilege of membership, who is default in payment of dues for three months, except as may be extended by the Board of Directors.

### 2.4 Termination
- A membership in the Council shall terminate on occurrence of any of the following events:
  1. Resignation of the member;
  2. Expiration of the period of membership, unless the membership is renewed on the renewal terms fixed by the Board;
  3. The member’s failure to pay dues, fees or assessments, as set forth by the Board, after they are due and payable;
  4. Any event that renders the member ineligible for membership, or failure to satisfy membership qualifications.

### 2.5 Nonliability of Members
- A member of the Corporation shall not be personally liable, solely because of membership, for the debts, obligations, or liabilities of the Corporation.

### ARTICLE III – VOTING MEMBERS

Only Governmental Member Voting Representatives and Honorary Members (collectively, the “Voting Members”) shall have the right to vote on any matters under these Bylaws, including but not limited to, the right exercised through those individuals eligible to vote for the election of a Director or Directors, or on a disposition of all or substantially all of the assets, or on a dissolution, or on any changes to the Articles of Incorporation or the Bylaws. Only the Voting Members shall be permitted to make motions and to vote on any issue at the Annual Business Meeting, special meetings and written consents. Voting by proxy is not permitted. Any person designated as a Governmental Member Voting Representative of more than one Governmental Member or who is also an Honorary Member shall be entitled to only one vote.
ARTICLE IV — GEOGRAPHICAL REPRESENTATION

4.1 Limitations - To encourage wide geographical representation, no more than two Governmental Member Voting Representatives designated by Governmental Members located in the same state may serve simultaneously on any one committee nor may more than two Governmental Member Voting Representatives designated by Governmental Members located in the same state serve simultaneously on the Board of Directors.

4.2 Distribution - To provide for geographical representation on the Board of Directors, the following sections are established:

<table>
<thead>
<tr>
<th>Section</th>
<th>Section(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Alaska, British Columbia, Washington, Oregon, California, Nevada Hawaii</td>
</tr>
<tr>
<td>B</td>
<td>Idaho, Montana, Wyoming, North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, Alberta, Saskatchewan, Manitoba</td>
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<tr>
<td>C</td>
<td>Utah, Arizona, Colorado, New Mexico, Oklahoma, Texas, Arkansas, Mexico</td>
</tr>
<tr>
<td>D</td>
<td>Nebraska, Kansas, Missouri, Illinois, Michigan, Indiana, Ohio, Kentucky, Ontario</td>
</tr>
<tr>
<td>F</td>
<td>Tennessee, Louisiana, Mississippi, Alabama, North Carolina, South Carolina, Georgia, Florida, the Caribbean</td>
</tr>
</tbody>
</table>

ARTICLE V — BOARD OF DIRECTORS

5.1 Governing Body - Subject to the limitations of the Certificate of Incorporation, these Bylaws and the laws of the State of Delaware, all corporate powers shall be exercised by the Board of Directors. The Board of Directors shall be composed of the following: President, Vice President, Secretary/Treasurer, the most Immediate Past President eligible; eight (8) Directors-at-Large, and six (6) Directors, one elected from each Section (“Sectional Directors”). Each member of the Board of Directors shall be a Governmental Member Voting Representative with the exception of the Immediate Past President. All members of the Board of Directors, except as provided in the Bylaws, shall be elected for a term of three years, and shall not serve for more than two consecutive full terms. However, nothing in this section shall preclude a Director initially appointed to a one or two year term, or appointed or elected to fill an unexpired term, from being elected to two subsequent full term(s). Each Sectional Director shall be and remain, throughout their term, a Governmental Member Voting Representative for a Governmental Member within the applicable Section.

5.2 Resignation, Disqualification and Vacancies - If the office of any director becomes vacant by reason of death, resignation, disqualification, removal or other cause, the President (or in the case the office of President is vacant, the Vice President) shall nominate a successor for the unexpired term and until their successor is elected and qualified at the next Annual Business Meeting, subject to the ratification of the Board of Directors. Any director, who ceases to be designated Governmental Member Voting Representative, for a period exceeding 60 days, shall automatically forfeit their position as a director.

5.2.1 Military Leave - Board members called to and serving active military duty shall not thereby become disqualified as a member of the board.
5.3 **Removal of a Director** - Any director may be removed from office upon the affirmative vote of two-thirds of the Voting Members present and voting at a duly held meeting of the members at which a quorum is present.

5.4 **Election** - Except as provided herein, the Board of Directors shall establish policies governing the conduct of elections and copies thereof shall be provided to any member requesting a copy. At each Annual Business Meeting a majority of the Voting Members present and voting shall elect such number of directors as necessary to fill vacancies of directors whose terms expire as of such meeting.

5.5 **Quorum** - At all meetings of the Board of Directors, two-thirds of the voting directors then in office shall constitute a quorum for transaction of business, and the act of a majority of the voting directors present at the meeting at which there is a quorum shall be the act of the Board of Directors, except as may be otherwise specifically provided by the law of the State of Delaware or by the certificate of incorporation. If a quorum shall not be present at any meeting of the Board of Directors, the directors present there at may adjourn the meeting from time to time, without notice other than announcement at the meeting until a quorum shall be present.

5.5.1 **Written Action** - Unless otherwise restricted by the certificate of incorporation or these Bylaws, any action required or permitted to be taken at any meeting of the Board of Directors may be taken without a meeting, if all voting members of the Board of Directors consent thereto in writing, and the writing or writings are filed with the minutes or proceedings of the Board of Directors.

5.5.2 **Participation in Meetings by Conference Telephone** - Members of the Board of Directors may participate in a meeting through use of conference telephone, electronic video screen communication, or other communication equipment if all of the following apply: (1) each director participating in the meeting can communicate with all of the other directors concurrently, (2) each director is provided the means of participating in all matters before the Board of Directors, including the capacity to propose, or to interpose an objection, to a specific action to be taken by the corporation and (3) the corporation adopts and implements some means of verifying both that (i) a person participating in the meeting is a director or other persons entitled to participate in the Board of Directors meeting and (ii) all actions of, or votes by, the Board of Directors are taken or cast only by the directors and not by persons who are not directors.

5.6 **Meetings of the Board of Directors** –

5.6.1 **General** - The Annual Meeting of the Board of Directors shall be held in conjunction with the time and place of the Annual Business Meeting. The Board of Directors shall meet at such other times and in such places as it may determine, and otherwise upon the call of the President or of a majority of the Board of Directors. Motions and votes at such meetings shall be duly recorded.

5.6.2 **Organizational Meeting** - At the conclusion of the Annual Business Meeting, the Board of Directors shall hold an organizational meeting at which time it may transact any necessary business, including any appointments pertinent to the ongoing business.

5.6.3 **Closed Meetings** - A meeting or portion of a meeting of the Board of Directors may be closed to persons not serving on the Board of Directors by a vote of the Board of Directors when matters that are sensitive to the purpose of the Council, including but not limited to budget, personnel, legal actions, and proprietary practices or materials are to be discussed. The Board of Directors may invite persons who are not members of the Board of Directors to attend portions, or all, of such closed meetings in an advisory capacity.

5.7 **Authority** - The Board of Directors may adopt any policy or procedure, or authorize any administrative action in the best interest of the Council and its membership.

5.8 **Emergency Actions** - In the event that the Board of Directors determines an emergency amendment to any International Code® or standard or supplements thereto is warranted, the same may be adopted by the Board of Directors. Such action shall require an affirmative vote of at least two-thirds
of the Board of Directors. The membership shall be notified, within ten days after the Board of Directors' official action, of any emergency amendment. At the next Annual Business Meeting any emergency amendment shall be presented to the members for ratification by a majority of the Voting Members present and voting.

ARTICLE VI — OFFICERS

6.1 Officers and Election - The Officers of the Council shall consist of a President, Vice President, Secretary/Treasurer (who shall be the chief financial officer of the Corporation), and Immediate Past President. Election of Officers for the ensuing year shall be held at the Annual Business Meeting, and Officers shall be elected from the Board of Directors by the Voting Members present and voting at the Annual Business Meeting, with the exception of the Immediate Past President. At no time shall more than one Officer located in any one state serve at the same time. Such Officers shall take office beginning at the conclusion of the Annual Business Meeting and shall serve until adjournment of the following Annual Business Meeting or until their successors are duly elected and qualified. Officers' tenure shall be limited to one single, full-year term in each office. Officers shall not act in their official capacity by proxy.

6.2 Duties of President - The President shall preside at the Annual Business Meeting, special meetings of the members and at meetings of the Board of Directors. The President shall be a regular member and preside at meetings of the Executive Committee and shall be an ex officio nonvoting member of all other committees. The President shall have other such duties as are prescribed by the Board of Directors or these Bylaws.

6.3 Duties of the Vice President - The Vice President shall act and perform the duties of the President during the President's absence from any meetings of this Corporation or the Board of Directors, or by a vote of the Board of Directors in case of disability of the President, and shall assist the President in the conduct of the office of President.

6.4 Duties of the Secretary/Treasurer - The Secretary/Treasurer shall be responsible for keeping the minutes and records of meetings, maintaining correspondence, receiving and disbursing funds, supervising financial affairs, approving expenditures as provided by resolution of the Board of Directors, and generally performing such official duties of a Secretary/Treasurer of a corporation. The Board of Directors may designate the Chief Executive Officer as the official agent for all or portions of such duties.

6.5 Resignation, Disqualification and Vacancies - If the position of any officer becomes vacant by reason of death, resignation, disqualification, removal or other cause, the President (or in the case the office of President is vacant, the Vice President) shall nominate a successor for the unexpired term and until their successor is elected and qualified at the next Annual Business Meeting, subject to the ratification of the Board of Directors. Any officer who ceases to be a member of the Board of Directors shall automatically forfeit their position as an officer.

ARTICLE VII — EXECUTIVE COMMITTEE

7.1 Executive Committee Members - There shall be an Executive Committee of the Board of Directors. The members of the Executive Committee shall be composed of the President, the Vice President, the Secretary/Treasurer and the Immediate Past President.

7.2 Powers and Duties - The Executive Committee shall have authority to act in such matters as are specifically delegated by the Board of Directors and take action on such matters delegated, as deemed prudent in furtherance of the general objectives of the Council. If an urgent situation arises and the President determines a matter requires immediate action or a timely decision, and it is not practical to convene a quorum of the Board of Directors, the Executive Committee shall have the authority to act on behalf of the Board unless otherwise specifically provided. The Executive Committee and the Chief Executive Officer
shall meet as necessary, between meetings of the Board of Directors, at a date and place designated by the President. Actions of the Executive Committee shall be reported to the Board of Directors without delay.

ARTICLE VIII — ADMINISTRATION

8.1 Chief Executive Officer - The Board of Directors shall appoint a Chief Executive Officer and such other officers as it shall designate, who shall serve at the pleasure of the Board. The Board of Directors shall fix the Chief Executive Officer's compensation. The Chief Executive Officer shall manage the affairs of the Council within the policies established by the Board of Directors and shall perform such other duties as may be assigned by the Board of Directors to the Chief Executive Officer. Neither the Chief Executive Officer nor any other officer appointed by the Board shall have a vote in the proceedings of this Council or of the Board of Directors.

ARTICLE IX — MEETINGS OF THE MEMBERS

9.1 Annual Business Meeting - A regular meeting of the Voting Members, herein referred to as the Annual Business Meeting shall be held each calendar year at a time and place designated by the Board of Directors.

9.1.1 Order of Business Meeting - The items of business at the Annual Business Meeting shall include, but not be limited to, the election of directors and officers, consideration of proposed amendments to these bylaws, and any other proper items of business as determined by the Board of Directors. The order of business as announced at the meeting may be changed by a majority vote of the Voting Members present and voting at the Annual Business Meeting.

9.2 Special Meetings - Special Meetings of the Voting Members may be called at any time by the President with approval of two-thirds of the Board of Directors. The President shall call a special meeting upon the receipt of a valid petition, specifying purpose of the special meeting and bearing the names, titles, addresses, and signatures of five percent of the Voting Members.

9.3 Quorum - A quorum for the transaction of business at any annual or special meeting shall consist of 100 Voting Members.

9.4 Meeting Notice - A notice of the time and place of a special meeting shall be published not less than 60 days prior to the start of the special meeting. A notice of the time and place of the Annual Business Meeting shall be published not less than 60 days prior to the start of the Annual Business Meeting.

9.5 Eligibility to Vote - Voting Members in good standing under these Bylaws shall be entitled to vote at any meeting of Voting Members. Each Voting Member entitled to vote may cast one vote on each matter submitted to a vote of the Voting Members.

ARTICLE X — CODE DEVELOPMENT PROCESS

The Board of Directors shall adopt a policy, which may be amended from time to time, on the Code Development Process for the International Codes®.

ARTICLE XI — COMMITTEES

11.1 Committees, Councils - The Board of Directors may establish committees and councils as it shall deem advisable. The President shall, with the concurrence of the Board, appoint or replace all members of committees and councils not otherwise specifically provided for herein.
11.2 Board Authority - Any member of any committee or council may be removed by the Board at any time, subject to the limitations of the laws of the State of Delaware, and subject to any limitations of the Certificate of Incorporation or Bylaws regarding actions which require approval of the Voting Members. Each committee or council shall be under the direction of the Board and shall have such authority as shall be delegated and prescribed by the Board.

11.3 Nominating Committee - There shall be a Nominating Committee chaired by the Immediate Past President and consisting of Governmental Member Voting Representatives and/or Honorary Members having a reasonably distributed geographical representation. The Board of Directors shall establish policies governing the Nominating Committee and the conduct of elections. The Nominating Committee, excluding the Chairperson, shall have no more than one Governmental Member Voting Representative or Honorary Member from any one state.

11.4 Meetings of Committees - Except as otherwise provided by these Bylaws, committees and councils shall comply with the policies established by the Board of Directors.

ARTICLE XII — CHAPTERS

12.1 Organization - The Council shall encourage and recognize the establishment of regional, state, student, professional, local area and international chapter organizations of its members, the purpose of which shall be the furtherance of the objectives of the Council. Applications for the establishment of a chapter, together with a copy of the proposed chapter Bylaws and a list of those who have agreed to become members of the chapter, shall be submitted to the Board of Directors for approval. The chapter shall be established upon approval by the Board of Directors.

12.2 Management - All chapters shall be managed in accordance with policies established by the Board of Directors.

ARTICLE XIII — AUDITING AND REPORTS

13.1 Fiscal Year - The fiscal year of the Council shall be as determined by the Board of Directors.

13.2 Audit - There shall be an audit of the activities and financial affairs of the Council at the end of each fiscal year by an independent auditor selected by the Chief Executive Officer with the advice and consent of the Board of Directors. Such audit shall be submitted to the Board of Directors.

ARTICLE XIV — INDEMNIFICATION, INSURANCE AND DIRECTOR LIABILITY

14.1 Definitions - For the purposes of this Article XIV, "agent" means any person who is or was a director, officer, employee, or other agent of the Corporation, or is or was serving at the request of the Corporation as a director, officer, employee, or agent of another foreign or domestic corporation, partnership, joint venture, trust, foundation, or other enterprise, or was a director, officer, employee, or agent of a foreign or domestic corporation which was a predecessor corporation of the Corporation or of another enterprise at the request of such predecessor corporation; "proceeding" means any threatened, pending, or completed action or proceeding, whether civil, criminal, administrative, or investigative; and "expenses" includes without limitation attorneys' fees and any expenses of establishing a right to indemnification under Sections 14.4 or 14.5(b) of these Bylaws.

14.2 Indemnification in Actions by Third Parties - The Corporation shall have power to indemnify any person who was or is a party to, or is threatened to be made a party to, any proceeding (other than an action by or in the right of the Corporation to procure a judgment in its favor, an action for which indemnification is prohibited under Delaware Law, or an action brought by the Attorney General or a person granted relator status by the Attorney General for any breach of duty relating to the assets held in charitable
trust) by reason of the fact that such person is or was an agent of the Corporation, against expenses, judgments, fines, settlements and other amounts actually and reasonably incurred in connection with such proceeding if such person acted in good faith and in a manner such person reasonably believed to be in the best interests of the Corporation and, in the case of a criminal proceeding, had no reasonable cause to believe the conduct of such person was unlawful. The termination of any proceeding by judgment, order, settlement, conviction, or upon a plea of nolo contendere or its equivalent shall not, of itself, create a presumption that the person did not act in good faith and in a manner which the person reasonably believed to be in the best interests of the corporation or that the person had reasonable cause to believe that the person's conduct was unlawful.

14.3 Indemnification in Actions by or in the Right of the Corporation - The Corporation shall have power to indemnify any person who was or is a party to, or is threatened to be made a party to, any threatened, pending or completed action by or in the right of the Corporation, or brought by the Attorney General or a person granted relator status by the Attorney General for breach of duty relating to assets held in charitable trust, to procure a judgment in its favor by reason of the fact that such person is or was an agent of the Corporation, against expenses actually and reasonably incurred by such person in connection with the defense or settlement of such action if such person acted in good faith, in a manner such person believed to be in the best interest of the Corporation, and with such care, including reasonable inquiry, as an ordinarily prudent person in a like position would use under similar circumstances. No indemnification shall be made under this Section 14.3:

(a) In respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the Corporation in the performance of such person's duty to the Corporation, unless and only to the extent that the court in which such proceeding is or was pending shall determine upon application that, in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for the expenses which such court shall determine;

(b) Of amounts paid in settling or otherwise disposing of a threatened or pending action, with or without court approval; or

(c) Of expenses incurred in defending a threatened or pending action which is settled or otherwise disposed of without court approval unless it is settled with the approval of the Attorney General.

14.4 Indemnification Against Expenses - To the extent that an agent of the Corporation has been successful on the merits in defense of any proceeding referred to in Sections 14.2 or 14.3 of these Bylaws or in defense of any claim, issue, or matter therein, the agent shall be indemnified against expenses actually and reasonably incurred by the agent in connection therewith.

14.5 Required Determinations - Except as provided in Section 14.4 of these Bylaws, any indemnification under this Article XIV shall be made by the Corporation only if authorized in the specific case, upon a determination that indemnification of the agent is proper in the circumstances because the agent has met the applicable standard of conduct set forth in Sections 14.2 or 14.3 of these Bylaws, by:

(a) A majority vote of a quorum consisting of Directors who are not parties to such proceeding; or

(b) The court in which such proceeding is or was pending upon application made by the Corporation or the agent or the attorney or other person rendering services in connection with the defense, whether or not such application by the agent, attorney, or other person is opposed by the Corporation.

14.6 Advance of Expenses - Expenses incurred in defending any proceeding may be advanced by the Corporation prior to the final disposition of such proceeding upon receipt of an undertaking by or on behalf of the agent to repay such amount unless it shall be determined ultimately that the agent is entitled to be indemnified as authorized in this Article XIV.

14.7 Other Indemnification - No agreement made by the Corporation to indemnify its (or its subsidiaries') Directors or Officers shall be valid unless such agreement is consistent with this Article XIV.
In the event of any inconsistencies between this Article XIV and any other provisions regarding indemnification of Directors and Officers by the Corporation, this Article XIV shall prevail. Nothing contained in this Article XIV shall affect any right to indemnification held by persons other than Directors and Officers.

14.8 Forms of Indemnification Not Permitted - No indemnification or advance shall be made under this Article XIV, except as provided in Section 14.4 or 14.5(b), in any circumstances where it appears:

(a) That it would be inconsistent with a provision of the Certificate of Incorporation, these Bylaws, or an agreement in effect at the time of the accrual of the alleged cause of action asserted in the proceeding in which the expenses were incurred or other amounts were paid, which prohibits or otherwise limits indemnification; or

(b) That it would be inconsistent with any condition expressly imposed by a court in approving a settlement.

14.9 Nonpaid Directors - Except as otherwise required under Delaware Law, there shall be no monetary liability on the part of, and no cause of action for damages shall be asserted against, any nonpaid Director, including any nonpaid Director who is also a nonpaid Officer of the corporation, based upon any alleged failure to discharge the person's duties as Director or Officer if the duties are performed in a manner that meets all of the following criteria:

(a) The duties are performed in good faith;

(b) The duties are performed in a manner such Director believes to be in the best interests of the Corporation; and

(c) The duties are performed with such care, including reasonable inquiry, as an ordinarily prudent person in a like position would use under similar circumstances.

14.10 Insurance - The Corporation shall have power to purchase and maintain insurance on behalf of any agent of the Corporation against any liability asserted against or incurred by the agent in such capacity or arising out of the agent's status as such whether or not the Corporation would have the power to indemnify the agent against such liability under the provisions of this Article XIV; provided, however, that the Corporation shall have no power to purchase and maintain such insurance to indemnify any agent of the Corporation for a violation that may not be indemnified under Delaware law.

14.11 Nonapplicability to Fiduciaries of Employee Benefit Plans - This Article XIV does not apply to any proceeding against any Director, investment manager, or other fiduciary of an employee benefit plan in such person's capacity as such, even though such person may also be an agent of the Corporation as defined in Section 14.1 of these Bylaws. The Corporation shall have power to indemnify such Director, investment manager, or other fiduciary to the extent permitted under Delaware Law.

If any part of this Article XIV shall be found in any action, suit or proceeding to be invalid or ineffective, the validity and the effectiveness of the remaining parts shall not be affected.

ARTICLE XV — AUTHORITY AND BENEFIT

15.1 No Benefit to Any Individual - No part of the net earnings, if any, of this Council shall inure to the benefit of any member or other individual, and no gain, profit, or dividends shall ever be distributed to any member of this Council or inure to the benefit of any private persons, except as provided for in these Bylaws.

15.2 No Authority to Act - A member or chapter or any officer or member thereof shall not participate in or purport to have authority to act on behalf of or bind this Corporation to any legal obligations or liability, except as provided in these Bylaws, or resolution or policy of the Board of Directors.
ARTICLE XVI — DISSOLUTION

In the event of a dissolution or final liquidation of the Council, all of the remaining assets and property of the Council shall, after paying or making provision for the payment of all of the liabilities or obligations of the Council and for necessary expenses thereof, shall be transferred to one or more organizations which will (i) dedicate such assets and property to public and/or charitable purposes, and (ii) qualify as tax exempt organizations under Section 501(c)(3), Section 501(c)(4), or Section 501(c)(6) of the Code.

ARTICLE XVII — RULES OF ORDER

Roberts Rules of Order shall govern all aspects of a parliamentary nature unless otherwise provided for by the Board of Directors.

ARTICLE XVIII — AMENDMENTS TO BYLAWS

18.1 Proposals - Proposed amendments to these Bylaws, to be considered at an Annual Business Meeting, shall be signed by at least 100 Voting Members and shall be presented to the Board of Directors at least 90 days prior to the opening of an Annual Business Meeting or must be proposed through resolution of at least ten of the members of the Board of Directors at least 90 days prior to the opening of an Annual Business Meeting.

18.2 Notice of Actions - The Board of Directors shall cause proposed amendments to the Bylaws to be printed in the Annual Business Meeting notice. The Board of Directors shall present its recommendations for each proposal, including reasons for recommending such action(s), at the Annual Business Meeting. These proposed amendments may be discussed and amended at the Annual Business Meeting, and if passed by a two-thirds vote of those Voting Members present, shall be sent by ballot, as amended on the floor, to all Voting Members of the Council for ratification. To be considered, the ballots submitted by the Voting Members shall be received within 30 days of distribution. A two-thirds majority of the ballots submitted by Voting Members is required for adoption. The returns shall be certified by the President if the necessary majority for adoption is received.

18.3 Effective Date - The approved amendments become effective ten days thereafter unless otherwise provided in the amendment.

ARTICLE XIX — OPERATIVE DATE

19.1 General - These Bylaws shall be effective and operative upon the date on which the Merger of International Code Council, Inc. (California) and International Code Council, Inc. (Delaware) becomes effective.

19.2 Committees - Council committees in existence as of the operative date of these Bylaws to the extent permitted under these Bylaws shall not be deemed abolished by the adoption of these Bylaws, subject to the right of the Board of Directors to remove them.

19.3 Previous Action Remains in Effect - Upon the operative date of these Bylaws, all prior actions consistent with these Bylaws, whether pursuant to resolution or policy, of the Board of Directors, or any other committee, remain in effect until modified, repealed or otherwise superseded.

[History: The original ICC Bylaws were approved on July 24, 2002. Seven amendments were presented to the ICC membership at the ABM on September 27, 2004. The amendments were approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on December 19, 2004, and became effective on December 29, 2004. One amendment was presented to the ICC membership at the ABM on September 27, 2005. The amendment was approved]
and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on January 3, 2006 and became effective on January 13, 2006. Two amendments were presented to the ICC membership at the ABM on September, 2006. The amendment was approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on April 5, 2007, and became effective on April 15, 2007. One amendment was presented to the ICC membership at the ABM on October 2, 2007. The amendment was approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on January 23, 2008, and became effective on February 2, 2008. One amendment was presented to the ICC membership at the ABM on September 16, 2008. The amendment was approved and ratified by letter ballot sent to all Governmental Members. The results of the election were certified by the ICC President on January 12, 2009, and became effective on January 14, 2009. Two amendments were presented to the ICC membership at the ABM on November 3, 2009. One amendment was approved and ratified by letter ballot sent to all Government Member Voting Representatives. The results of the election were certified by the ICC President on February 26, 2010. Four amendments were presented to the ICC membership at the ABM on November 1, 2011. One amendment was approved and ratified by letter ballot sent to all Government Member Voting Representatives. The results of the election were certified by the ICC President on February 7, 2012. One amendment was presented to the ICC membership at the ABM on October 23, 2012. The amendment was approved and ratified by letter ballot sent to all Governmental Member Voting Representatives. The results of the election were certified by the ICC President on February 5, 2013. An amendment was presented to the ICC membership on October 22, 2020 as part of a statutory merger ballot. The statutory merger ballot and relative amendment were approved on November 12, 2020 and became effective on January 1, 2021. Two amendments were presented to the ICC membership at the ABM on September 20, 2021. The amendments were approved and ratified by electronic ballot sent to all Voting Members. The results of the election were certified by the ICC President on December 1, 2021 and became effective on December 10, 2021.]
The country needs to build 4.3 million more apartments by 2035.

### NATIONAL DATA

Apartments and their residents contribute $3.4 trillion to the U.S. economy annually, supporting 17.5 million jobs.

The number of affordable units (those with rents less than $1,000 per month) declined by 4.7 million from 2015 to 2020.

### Our Resources

The apartment industry is ready to work with urban, suburban and rural communities in every region to meet the housing demand of Americans across all income levels.

Our Resources
Regulation: 40.6 Percent of the Cost of Multifamily Development

Paul Emrath, National Association of Home Builders (NAHB)
Caitlin Sugrue Walter, National Multifamily Housing Council (NMHC)

Regulation imposed by all levels of government accounts for an average of 40.6 percent of multifamily development costs, according to research by NAHB and NMHC.

Apartment development can be subject to a significant array of regulatory costs, including a broad range of fees, standards and other requirements imposed at different stages of the development and construction process. This joint research effort surveyed NAHB and NMHC members to quantify how much regulation exists and how much it is adding to the cost of developing much-needed new multifamily properties.
About NAHB

The National Association of Home Builders (NAHB) strives to protect the American Dream of housing opportunities for all, while working to achieve professional success for its members who build communities, create jobs and strengthen our economy. NAHB Multifamily provides services, benefits and opportunities to members with an interest in multifamily housing, including multifamily member meetings, newsletters, events, webinars and multifamily housing awards. It coordinates with other NAHB departments on advocacy efforts, economic studies and resources for multifamily housing. For more information, please visit NAHB Multifamily at nahb.org/nahb-community/councils/multifamily-council.

About NMHC

Based in Washington, D.C., the National Multifamily Housing Council (NMHC) is the leadership of the apartment industry. We bring together the prominent owners, managers and developers who help create thriving communities by providing apartment homes for 40 million Americans, contributing $3.4 trillion annually to the economy. NMHC provides a forum for insight, advocacy and action that enables both members and the communities they help build to thrive. For more information, contact NMHC at 202/974-2300, e-mail the Council at info@nmhc.org, or visit NMHC’s website at nmhc.org.
Introduction

Multifamily development is subject to a variety of regulations at all levels of government. While some of these regulations are necessary to protect the health and safety of residents as well as the integrity of the building or community, it is informative to know the financial impact of each type of regulation, particularly in an era of widespread cost increases and worsening affordability problems for renters. Each added cost means the developer must increase rents for the project to remain financially feasible.

Regulations cover a wide-range of issues, and while they may be well-intentioned, the costs and burdens of any regulation must be carefully weighed against the benefits. Few would argue, for example, that basic safety standards for structures and workers are unnecessary. But, when regulation constitutes an average of 40.6 percent of a project’s development costs, this raises questions about how thoroughly governments are considering the consequences of their actions. Are they aware of how much regulation currently exists? Do they realize how multiple regulations with conflicting standards can cause delays and increase costs? And do they understand the extent to which these increased costs translate into higher rents and make it difficult to build new housing that families with modest incomes can afford?

Recently, the National Association of Home Builders (NAHB) and the National Multifamily Housing Council (NMHC) undertook a joint research effort to find out how much government regulation adds to the cost of building new multifamily housing via a survey distributed to multifamily developers. (See Appendix 2).

The research finds that an average of 40.6 percent of total development costs can now be attributed to complying with regulations imposed by all levels of government. Figure 1 shows how this percentage breaks down among the various types of regulation.

Figure 1. Average Cost of Regulation as a Percent of Total Multifamily Development Cost

Source: NAHB and NMHC
Perhaps more importantly, some of these regulatory mandates can discourage developers from building in the very marketplaces that have the greatest need for more housing. This can prove to be particularly burdensome in a world of rising costs. For example, 47.9 percent of multifamily developers said they avoid building in jurisdictions with policies such as inclusionary zoning, and a full 87.5 percent will avoid building in a jurisdiction with rent control in place.

There are also significant obstacles to development at the community level that are unrelated to governmental regulation. For instance, our research shows that “Not in My Backyard” (NIMBY) opposition to multifamily development adds an average of 5.6 percent to total development costs and delays the delivery of new housing by an average of 7.4 months. While most Americans agree that we need more housing and more housing affordable to middle-income households, too many change their opinion when someone proposes to put that new housing in their neighborhood. The intensity of opposition is escalated if that housing is rental housing.

About the Research

NAHB and NMHC distributed an identical survey in April 2022 to their respective memberships to access a wide range of development scales across the United States. The primary purpose was to quantify how much regulation exists for developers to contend with and how much that regulation is adding to the cost of developing new multifamily properties.

Some of these questions quantify the impact of regulations, such as inclusionary zoning and rent control, that not only may directly increase the costs of projects that are built but affect the supply and cost of housing in the community by causing some projects not to be built at all. An additional set of questions asked about the financial impact of NIMBYism, an issue that has been widely identified as one of the major cost drivers impacting affordability but where little quantifiable data currently exists.

A total of 49 usable responses were received. The responses from the survey were combined with existing public data and other survey collections to calculate the financial cost as a percent of total development cost for each regulation. A detailed description of the assumptions used in the calculations can be found in Appendix 1.
Total Cost of Regulations

Regulatory costs that exist during the multifamily development process can be divided into several categories. Table 1 shows the share of developer respondents subject to these various regulations and the average cost of each category as a percentage of the total development cost.

### Table 1. Average Regulatory Costs as a Share of Total Multifamily Development

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Share With the Regulatory Cost</th>
<th>Regulation as a Percent of Total Development Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of applying for zoning approval</td>
<td>93.9%</td>
<td>3.4% 3.2%</td>
</tr>
<tr>
<td>Costs when site work begins (fees, required studies, etc.)</td>
<td>98.0%</td>
<td>8.7% 8.5%</td>
</tr>
<tr>
<td>Dev. requirements (layout, mats, etc.) beyond the ordinary</td>
<td>91.8%</td>
<td>5.8% 5.4%</td>
</tr>
<tr>
<td>Cost of land dedicated to the government or left unbuilt</td>
<td>51.0%</td>
<td>4.7% 2.6%</td>
</tr>
<tr>
<td>Fees charged when building construction is authorized</td>
<td>95.9%</td>
<td>4.6% 4.4%</td>
</tr>
<tr>
<td>Costs of affordability mandates (e.g., inclusionary zoning)</td>
<td>38.8%</td>
<td>69% 2.7%</td>
</tr>
<tr>
<td>Changes to building codes over the past 10 years</td>
<td>100.0%</td>
<td>11.1% 11.1%</td>
</tr>
<tr>
<td>Complying with OSHA/other labor regulations</td>
<td>93.9%</td>
<td>2.7% 2.6%</td>
</tr>
<tr>
<td>Pure cost of delay (if regulation imposed no other cost)</td>
<td>95.9%</td>
<td>0.5% 0.5%</td>
</tr>
<tr>
<td><strong>TOTAL COST OF REGULATION</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>40.6% 40.6%</strong></td>
</tr>
</tbody>
</table>

* The base is different for every percentage in this column, so the line items are not additive.

Source: NAHB and NMHC

As Table 1 indicates, the highest average regulatory cost is the result of changes to building codes over the past 10 years (11.1 percent of total development costs). The second highest are the costs imposed when site work begins (8.7 percent). The lowest average cost impact was the pure financial cost of delay, consisting of 0.5 percent when present, lower than the average cost of complying with Occupational Safety and Health Administration (OSHA) or other labor regulations (2.7 percent when present).

The first significant interaction between a multifamily developer and the government typically occurs when the developer applies for zoning approval to allow multifamily housing to be built on a particular parcel of land. Regulatory costs at this stage can vary from costs associated with fees owed to the local jurisdiction for proceeding through the approval process to market or environmental impact studies that must be commissioned from private consultants.

In some cases, a developer can acquire land that allows for multifamily structures to be built on it without requiring rezoning or a special exemption. However, this is rare, with 93.9 percent of the respondents indicating that they must dedicate resources to rezone the land to allow multifamily construction. When they exist, these costs average 3.4 percent of the total development cost.

Once site work begins, local jurisdictions often require a variety of fees or other studies. Examples of fees could include impact fees (fees charged only on a new development to be used for capital improvements) or utility impact fees. Almost all respondents (98.0 percent) reported paying some of these costs in their typical project, representing an average of 8.7 percent of total development costs when present.
Most respondents (91.8 percent) were also required by their local jurisdiction to include certain design features in their project design that go beyond what they would ordinarily include. Examples include energy-efficiency upgrades or specific design requirements for facades. When present, complying with these requirements amounted to an average of 5.8 percent of total development costs.

Governments can also require developers to leave a portion of the development site dedicated for government use or left unbuilt. This requirement reduces the amount of developable area, which means the revenue from that area is lost and must either be absorbed or made up for elsewhere. This requirement was present for approximately half (51.0 percent) of respondents; when present, it represented an average of 4.7 percent of total development costs.

Jurisdictions also often charge fees when site work is completed to authorize building construction. Examples of these costs include a fee when filing for a building permit or fees for additional utility hook-ups. Almost all respondents (95.9 percent) reported paying some sort of fee at this phase of development, with an average cost of 4.6 percent of total development cost when present.

Local affordability mandates are another important cost driver. These mandates are designed to increase the supply of affordable apartments. A common example is inclusionary zoning, where developers must offer a certain percentage of apartments at below-market rent levels. In many cases, a density bonus is provided to developers, which allows them to include more units in their project than ordinarily permitted by zoning to offset those lowered rents.

Unfortunately, these incentives are often inadequate and do not fully cover the lost rental revenue. In those cases, developers are forced to raise rents on the unrestricted apartments to fill the gap or to abandon the project altogether because it is no longer financially feasible. These mandates were present in slightly over one-third (38.8 percent) of respondents’ typical projects, and when present, they made up an average of 6.9 percent of total development costs (Figure 2). Respondents subject to inclusionary zoning report having to raise rents by an average of 7.6 percent.

Figure 2. Is Respondent’s Typical Project in a Jurisdiction with Inclusionary Zoning? (Percent of Respondents)

Source: NAHB and NMHC

1 NAHB has developed an Inclusionary Zoning Calculator Tool to help developers and local jurisdictions determine if incentives are adequate to allow a project to be built.
The increase in costs to comply with changes to building codes over the past 10 years was the largest driver of development cost, amounting to 11.1 percent of total development costs.

Most jurisdictions have been adopting, revising and enforcing building codes for decades, and an entire industry has emerged supporting and encouraging changes to existing building codes. While building codes play an important role in protecting resident safety and building integrity, they have evolved well beyond their original purpose and now are also used to promote public policies like energy efficiency and sustainability.

Building code development and adoption are complex, and it is essential to consider impacts to housing affordability throughout the process. State and local jurisdictions adopt and enforce building codes, but federal policymakers are also active in the development of international model codes, and they promote the adoption of certain code editions. For example, the U.S. Department of Energy encourages states to adopt the most stringent versions of the model energy codes. Various policy groups, industry organizations and individual companies also advocate for code changes that promote specific goals. These changes do not always balance the needs of housing affordability and have the potential to drive up construction costs without improving building safety or integrity.

Developers are also subject to complying with Occupational Safety and Health Administration (OSHA) requirements and other labor regulations throughout the development process. While measures to protect the safety and health of construction workers are essential, NAHB has argued that some OSHA policies, like applying its beryllium standards to residential construction, simply drive construction costs up without impacting health or safety.

Fully 93.9 percent of respondents said they had to comply with these regulations and that they added 2.7 percent to total development costs.

Almost all respondents (95.9 percent) also reported that complying with regulations caused some sort of delay for their typical project. We estimate that “pure” cost of delay—the financial cost that taking the time to comply with that regulation would incur—would be an average of 0.5 percent of total development costs. This may not seem like a substantial number, but in an era of rising costs and diminishing affordability, any additional cost can impact project feasibility.

Affordability Mandates and Neighborhood Opposition Can Discourage Development Altogether

Aside from increasing development costs, some regulations and restrictions can impact whether development even occurs, which is incredibly harmful given the nation’s shortage of housing.

There are many factors a developer considers when choosing a potential site for a future development; primary among them is the market demand for the proposed units. Increasingly, however, developers are also forced to consider whether their chosen jurisdiction imposes affordability mandates on new development. Two of the most popular mandates are inclusionary zoning and rent control because they are wrongly deemed to be “quick and free” fixes to housing affordability challenges.

2 NAHB’s subsidiary Home Innovation Research Labs has recently produced a report showing that codes adopted in 2018 increase construction costs for standard types of multifamily buildings between $2,500 and $25,000.
Research has shown, however, that these quick fixes, particularly rent control, have many pitfalls. One major pitfall of both, as shown in Figure 3, is that it can deter development completely. Almost half of the respondents (47.9 percent) reported that they avoid building in jurisdictions with inclusionary zoning policies. The response was more acute for rent control—the overwhelming majority of respondents (87.5 percent) reported they avoid building in jurisdictions where rent control is present.

In fact, these mandates can impact the financial feasibility of a project, both in the short-term and long term. As a result, developers may simply choose to avoid jurisdictions with these mandates because of the difficulty in making a project pencil out.

Rent control regulations similarly differ depending on the local jurisdiction. In its basic form, rent control is a restriction on how much a property owner can raise a resident's rent, ignoring market conditions. Some rent control laws exempt new construction from price controls, and others institute a cap on how much an owner can raise a resident's rent, often tied to the Consumer Price Index (CPI).

Another major impediment to whether a project gets built can be neighborhood opposition. Opposition against multifamily development by current residents, commonly referred to as "Not in My Backyard" (NIMBY) opposition, can take many different forms. Residents may fight against rezoning attempts or may even file lawsuits to attempt to prevent development from occurring. Approximately three-quarters (74.5 percent) of respondents reported encountering neighborhood opposition to multifamily construction (Figure 4). The resources required to overcome this opposition add an average 5.6 percent increase in development costs when present. They also delay the development timeline by an
average of 7.4 months.

Figure 4. Have Developers Encountered Neighborhood Opposition To Multifamily Construction? (Percent Of Respondents)

Yes 74.5%
No 25.5%

Average impact when neighborhood opposition is present:
5.6% increase in development costs
7.4 months delay

Source: NAHB and NMHC

Conclusion

As the above discussion has demonstrated, multifamily development can be subject to many regulatory costs, including a broad range of fees, standards and other requirements imposed at different stages of the development and construction process. Because of this, it may not be surprising that regulation imposed by all levels of government accounts for 40.6 percent of multifamily development costs on average.

This research was solely restricted to the impact of regulations on total development costs. It is important to note that developers are also dealing with rapidly rising land, material, and labor costs. Combined, these costs make it virtually impossible for private sector developers to deliver housing at a price point that many working Americans can afford.

When multifamily development costs rise, it unavoidably translates to higher rents and reduced rental housing affordability. Multifamily developers cannot secure financing to build their projects unless they can demonstrate to lenders that the rents will be sufficient to cover costs and pay off the loans.

The purpose of this report is not to argue that all regulation is bad and should be eliminated, but that some of these regulations are likely duplicative as multiple levels of government impose regulations on the same project. In addition, many of these regulations do not have a relationship to resident safety or building integrity.

The research aims to raise awareness of how much regulation currently exists, how much it costs and to encourage governments to do a thorough job of considering the implications for housing affordability when proposing and implementing new directives. It is also to help inform local leaders that they also have the power to waive some of these duplicative costs, thus lowering the rent required for the project to remain financially feasible and improving affordability.
Respondent Profile

A total of 49 usable responses were received from multifamily developers, with a slightly higher concentration of NAHB members than NMHC members (and no duplicates). In one instance, two survey responses were accepted from one member company because the respondents represented different geographic areas.

All geographic areas in the United States were represented (see Figure 5). Respondents were able to choose more than one region of operation. The South Atlantic region (DE, DC, FL, GA, MD, NC, SC, VA, WV) had the largest representation, with 42.9 percent of respondents operating there, followed by the Mountain region (AZ, CO, ID, NM, MT, UT, NV, WY) with 30.6 percent and the Pacific region (AK, CA, HI, OR, WA) with 22.4 percent. The West North Central (IA, KS, MN, MO, NE, ND, SD) and West South Central (AR, LA, OK, TX) had the lowest representation at 6.1 percent of respondents each.

![Figure 5. Share of Respondents Who Build in Each of the Nine Census Divisions](image)

Source: NAHB and NMHC; U.S. Census Bureau

The respondents’ typical project size varied widely: from fewer than 10 units to 499 (see Figure 6). The majority of respondents (54.2 percent) reported a typical project size of 150 to 349 units. Note that this is project size, not building size, meaning that each category could comprise both garden-style communities, which frequently have units spread across multiple buildings, as well as high-rise buildings, where all units are traditionally in one building.
The typical total development cost varied as well but was slightly more evenly distributed (Figure 7). The average total development cost of respondents for a typical project was $53.6 million. Barely over one-third (37.6 percent) reported a typical development cost of $50 to $99,999 million. Small and large projects were equally represented, with 17.8 percent of respondents reporting a cost of less than $10 million and 15.6 percent indicating the typical project costs at least $100 million.
Appendix 1: Assumptions Used in the Calculations

To calculate a final effect on development costs, many of the NAHB-NMHC survey responses need to be combined with additional information. Primarily these are assumptions about the terms of development and construction loans, how long construction typically takes, and how to allocate costs to different stages of the development and construction process. This appendix lists all the assumptions used in the calculations and gives the sources for each.

**Loan Terms**

1. 1 point charged for all land acquisition, development, and construction (AD&C) loans, based on results from a Quarterly Finance Survey (QFS) that NAHB was conducting in the early to mid-2000s.

A 7.65 percent interest rate on all AD&C loans. The QFS indicates that rates are typically set one point above prime, and 6.65 percent is NAHB’s estimate of the prime rate that would prevail in the long run under neutral Federal Reserve policy.

The estimates also assume that three-fourths of any category of costs are financed, based on typical AD&C loan-to-value ratios in the QFS.

**Construction Lags**

The source for information lags not directly collected in the NAHB-NMHC questionnaire is the Survey of Construction, conducted by the Census Bureau and partially funded by the Department of Housing and Urban Development.

Preliminary estimates are taken from the published annual tables, averaged over the 2001-2016 period:
Authorization to start = 1.71 months
Start to completion = 10.87 months

If the project is 5-9 units
• Authorization to start = 1.95 months
• Start to completion = 11.64 months

If the project is 10+ units
• Authorization to start = 1.94 months
• Start to completion = 13.21 months

The NAHB-NMHC survey collected data on how much time regulation adds to the development process. To assign this to a particular phase of the development, the following assumptions are used.

The regulatory delay is split and attributed half to the lag between applying for zoning approval and the beginning of site work and half to the period after site work begins. If half of the regulatory delay exceeds the lag between applying for approval and the beginning of site work, the excess is also attributed to the period after site work begins.

It is first assumed that the resulting regulatory delay is attributable to the period between the start of site work and the start of building construction, minus three months (the assumed minimum time it would take to do site work in the absence...
of regulation, based on conversations with developers). If any regulatory delay remains after being allocated to the zoning approval and site work periods, it is then attributed to the building construction period, and the start-to-completion lag is adjusted upward beyond the SOC-based average, accordingly.

The analysis assumes all loans are paid off when the buildings are completed.

**Cost Breakdown**

To implement the process described in the paragraph above and calculate a “pure” cost of delay (i.e., the effect regulatory delay would have even if the regulation imposed no other cost), estimates of costs incurred during different phases of the development process are needed.

The breakdown is based on the split between lot and construction costs in NAHB’s Construction Cost Surveys (averaged over surveys conducted since 2000) and the Census Bureau’s “non-construction cost factor” for raw land. The calculations also assume three-fourths of these costs are financed, based on typical AD&C loan-to-value ratios in the QFS.

Resulting assumptions:

- Only the cost of applying for zoning occurs at the very start of the development process. Financing costs associated with this are charged to the regulatory cost of the application and not counted in the pure cost of delay.
- 10.2 percent of total development represents costs financed by a land acquisition loan at the start of the site work phase.
- 10.8 percent of total development costs represent costs financed by a development loan during the site work phase, assuming draws on the loan occur on average halfway through this phase.
- 54.0 percent of total development costs represent costs incurred after building construction has started and financed with a construction loan, again assuming draws on the loan occur on average halfway through the site work phase.
Appendix 2: Survey Questionnaire

1. What regions do you build in? Please select all that apply.
   - New England (CT, ME, MA, NH, RI, VT)
   - Mid Atlantic (NJ, NY, PA)
   - South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV)
   - East North Central (IN, IL, MI, OH, WI)
   - West North Central (IA, KS, MN, MO, NE, ND, SD)
   - East South Central (AL, KY, MS, TN)
   - West South Central (AR, LA, OK, TX)
   - Mountain (AZ, CO, ID, NM, MT, UT, NV, WY)
   - Pacific (AK, CA, HI, OR, WA)

2. How many units does your typical multifamily project have?
   - 2-4 Units
   - 5-9
   - 10-49
   - 50-149
   - 150-349
   - 350-499
   - 500 units or more

3. What is the total dollar amount spent on development costs in your typical project?
   $__________

4. For a typical piece of land, how much does it cost to apply for zoning approval as a % of total development cost? (Include costs of fiscal or traffic impact or other studies and any review or other fees that must be paid by the time of application. Please enter “0” if application costs are Zero percent).
   _______%

5. For a typical project, how many months does it take between the time you apply for zoning approval and the time you begin site work?
   ___________months

6. How much does it cost to comply with regulations when site work begins, as a % of total development costs? (Include costs of complying with environmental or other regulations as well as the cost of hook-up or impact or other fees.) Please enter “0” if cost of complying with these regulations is Zero percent.
   ___________%
7. How much do development requirements that go beyond what you would otherwise do (in terms of property layout, landscaping, materials used on building facades, etc.) add to your cost as a % of total development costs? (Please enter “0” if the jurisdiction’s requirements don’t go beyond what you would normally do.)

___________%

8. In the typical case, what is the value of any land that must be dedicated to the local government or otherwise left unbuilt (for parks, open green space, etc.) as a % of total development cost? (Please enter “0” if dedicating land is required infrequently.)

___________%

9. How many months does it take between the time you begin site work and the time you obtain authorization to begin construction of the apartment building(s)?

___________ months

10. How much extra time (in months) overall does complying with regulations add to the development process? (Please enter “0” if regulations typically cause no delay).

___________ months

11. When you obtain authorization to begin construction, how much do you pay in additional fees as a % of total development costs? In many cases, this will be only a permit fee but include any additional impact or hook-up or inspection fees if they kick in at this time. (Please enter “0” if fees paid during or after construction are Zero percent).

___________%

12a. In the typical case, does a jurisdiction have inclusionary zoning/affordable housing requirements that apply to your project?

- Yes
- No

12b. [If the answer to 12a is “yes”]. In the typical case, how much do these requirements (or a fee in lieu of affordable housing) cost as a % of total development cost? (Please enter “0” if inclusionary zoning/affordable housing mandates/fees in lieu of affordable housing are encountered infrequently).

___________%

12c. [If the answer to 12a is “yes”]. In the typical case, how much do these additional requirements raise the rents of market-rate units?

___________%

13. Do you typically avoid building in a jurisdiction if it has an inclusionary zoning requirement?

- Yes
- No

14. Do you typically avoid building in a jurisdiction that has rent control?

- Yes
- No
15. Over the past 10 years, how much have changes in construction codes and standards added to the cost of building a typical multifamily project as a % of total development costs? (Please enter “0” if code changes have had minimal impact on costs).

_____________%

- Please select if you have not been in operation for the past 10 years

16. How much does complying with OSHA or other labor regulations cost, as a % of total development cost? (Please enter “0” if labor regulations have no impact on development costs).

_____________%

17. Have you experienced added costs or delays due to neighborhood opposition to multifamily construction?

- Yes
- No

18. In the typical case, how much costs are added to a project due to neighborhood opposition to multifamily development as a % of total development costs?

_____________%

19. In a typical case, how much extra time (in months) does it take to address neighborhood opposition to multifamily development?

_____________ months

20. Comments:
ICC MEMORANDUM

TO: Energy Code Development Committees, Subcommittees and Interested Parties
FROM: Mike Pfeiffer, PE, Senior Vice President of Technical Services
RE: Discount Rates and Code Content
DATE: February 15, 2022

The Code Council appreciates the considerable effort to date by members of the Commercial and Residential Consensus Committees, Subcommittees and interested parties to develop the 2024 International Energy Conservation Code and Chapter 11 of the International Residential Code under a standards development process. We are aware of two issues before the committees which if not resolved expeditiously may lead to an inability to complete the Committees’ work in a timely manner. This memorandum provides direction to the committees on the use of discount rates in cost effective analysis and the placement of code content in the IECC and IRC, as applicable.

Discount Rates:
In the framework and subsequent committee procedures issued by the Code Council Board of Directors, the procedures for use of cost effectiveness analysis are provided. Per these procedures, “underlying assumptions should be clearly documented including compliance with any parameters set by the committees and approved by the Board.” Groups tasked by the committees to develop parameters have successfully reached consensus on many of the items. However, agreement on the discount rate(s) to be used has not been reached to date.

The direction below points to discount rates set by the U.S. Office of Management and Budget (OMB) for use in analysis conducted by federal agencies (including the U.S. Department of Energy). These rates are currently used to support the statutory review DOE conducts upon release of a new edition of the IECC. Cost effectiveness analysis is an important tool for use by the committee in determining the resolution of a proposal. It is up to individual committee members and the Consensus Committees to determine the weight they place on results of a cost effectiveness analysis as it relates to the action taken on the proposals for which cost effectiveness is a consideration.

The Code Council provides the following direction:
Consistent with guidance from the U.S. Office of Management and Budget (Circular A-4) the Committees shall conduct cost effectiveness analysis using discount rates of both 3 percent and 7 percent for evaluation of the public input proposals currently under consideration. If OMB revises these rates prior to the posting of Public Comment Draft 1 for comment, the updated discount rates will be used for those comments.

Code Content:
In the new framework approved by the Board in March 2021, a new scope and intent were developed for the IECC and Chapter 11 of the IRC. While this new scope and intent is considerably more detailed than the prior scope and intent, there is some confusion within the Committees on what topics can be addressed within the body of the IECC or IRC Chapter 11 as minimum requirements as opposed to an IECC or IRC appendix.
Discount Rates and Code Content Memorandum
February 15, 2022
Page Two

The scope and intent of ICC codes and standards are set by the Board of Directors in accordance with Council Policy 28. The Board has not previously provided updates or clarification to the scope or intent of codes or standards during an active development process, allowing the development process to proceed to resolution. If a topic is contained in the scope or intent statement, it may be included either in the base of the code or as an appendix, as determined by the consensus body. Generally, appendices in the I-Codes fall under one of two categories: available for state/local adoption and for informational purposes only. In both cases, they undergo the rigors of the process no differently than text considered for the minimum requirements in the code. Each appendix in the respective I-Code notes the specific application of the appendix.

The Code Council provides the following direction:

Any content within the scope and intent of the code may be included either in the body of the code as minimum requirements or as an adoptable appendix based on the determination of the responsible Consensus Committee. Where content is to be included in an adoptable appendix, the appendix must include mandatory enforceable language.

Cc: Dominic Sims, CEO